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CHROMOSOME NUMBERS AND NOTES ON THE TAXONOMY OF SELECTED ALASKAN VASCULAR PLANTS

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ABSTRACT. Chromosome counts are documented and discussed for 44 Alaskan vascular plant taxa. Five of these are either first counts or new numbers for these taxa. A new combination, *Cardamine microphylla* subsp. *blaisdellii* is presented.

Key Words: Alaska, chromosome numbers, *Cardamine microphylla* subsp. *blaisdelli*

Notwithstanding the tremendous advances in plant systematics as molecular data have become more widely available, basic studies of the genome remain important to the circumscription of taxa. The work of many years in arctic Russia by Zhukova and her associates (for example, Zhukova 1966, 1980, 1982; Zhukova and Petrovsky 1971, 1977, 1984, 1985; Zhukova, Petrovsky, and Plieva 1973) and in Alaska by, among others, Dawe (1979), Dawe and Murray (1979, 1980, 1981a, b), Knaben (1968), Johnson and Packer (1968), and Packer and McPherson (1974) demonstrated that there is much more cytological variability within morphological species than previously appreciated. We offer here chromosome counts for Alaskan taxa that provide a) first counts or new numbers for taxa, b) first counts for Alaska, c) counts that document variations of chromosome number, as well as d) examples of chromosomal conservatism over wide geographic areas (Table 1).

MATERIALS AND METHODS

We obtained chromosome counts from root tips prepared by the squash technique. Seeds were stratified on damp filter paper

Table 1. Summary of numbers reported.

	$2n$ =	Other Counts
Asteraceae		
Arnica griscomii subsp. *frigida*	ca. 36–38	38, 57, 58, 60, 70, 76
Artemisia borealis	36	18, 36
Artemisia furcata	72	18, 36, 90
Artemisia senjavinensis	36	36, 54
Crepis nana	14	14
Saussurea nuda	26	26
Taraxacum carneocoloratum	ca. 36	32
Tephroseris yukonensis	ca. 46	
Brassicaceae		
Braya glabella	ca. 56	28, 56, 64
Cardamine microphylla subsp. *blaisdellii*	28	28, 42
Cochlearia groenlandica	14	14
Draba cinerea	ca. 48	48, 64
Draba glabella	ca. 64	64, ca. 75, 80
Smelowskia borealis	12	12
Smelowskia calycina var. *integrifolia*	12	22, 24
Smelowskia pyriformis	12	
Caryophyllaceae		
Gastrolychnis involucrata	48	48
Gastrolychnis taimyrensis	48	48
Honckenya peploides	68	66, 68–70, 70
Minuartia arctica	80	ca. 50, 52, 80
Silene williamsii	24	24
Wilhelmsia physodes	70	50–60, 66, 72, 100–110
Fabaceae		
Astragalus aboriginum	16	16, 32
Astragalus nutzotinensis	22	22
Oxytropis arctica	48	48, 96
Oxytropis bryophila	ca. 32	32
Gentianaceae		
Gentiana glauca	24	24
Onagraceae		
Epilobium hornemannii	ca. 36	36
Papaveraceae		
Papaver alboroseum	28	28
Papaver macounii subsp. *discolor*	28	28, 70
Papaver mcconnellii	28	
Papaver walpolei	14	14

Table 1. Continued.

	2*n* =	Other Counts
Polemoniaceae		
Polemonium acutiflorum	18	18
Polygonaceae		
Rumex acetosa subsp. *alpestris*	15	14, 15
Primulaceae		
Androsace septentrionalis	20	20
Primula egaliksensis	36	36, 40
Ranunculaceae		
Ranunculus cymbalaria	16	16
Ranunculus gmelinii	16	16, 32
Ranunculus pygmaeus	16	16
Rosaceae		
Potentilla egedii	28	28
Saxifragaceae		
Boykinia richardsonii	ca. 80	36, 84
Saxifraga nelsoniana	ca. 80	60, 64, 80, 84
Saxifraga nudicaulis	40	40
Saxifraga reflexa	20	20

at 5 to 8°C for four weeks, then germinated under alternating conditions of light and dark at temperatures of 15 and 8°C, respectively. Root tips were pretreated in a 0.002M solution of 8-hydroxyquinoline for 2 to 3 hours at 10°C, then fixed in a 3:1 solution of 95% ethanol:glacial acetic acid. Chromosomes were stained with leucobasic fuchsin dye following the Feulgen procedure in Darlington and LaCour (1975). Voucher specimens have been deposited at the Herbarium of the University of Alaska Museum (ALA).

Synonyms and misapplied names are included when they facilitate cross references to widely used floras and the chromosome atlases cited below, particularly with respect to Löve and Löve (1975), who favored numerous generic segregates. We have tried to incorporate recent information from monographers; hence, the names we use depart in several instances from the nomenclatural foundation provided by Hultén (1968), Porsild and Cody (1980), and Welsh (1974). We also have derived important taxonomic perspectives from the *Arctic Flora U.S.S.R.*, edited over the many

years of its production (1960–1987) by A. I. Tolmachev and B. A. Yurtsev, and these instances also are cited below.

Label data for voucher specimens documenting each count contain a reference to Quads. These are the U.S. Geological Survey quadrangle maps (1:250,000 scale topographic series), which serve in Alaska as the equivalent of counties.

RESULTS

ASTERACEAE

Arnica griscomii Fernald subsp. *frigida* (C. A. Mey. ex Iljin) S. J. Wolf

A. louiseana Farr subsp. *frigida* (C. A. Mey. ex Iljin) Maguire, *A. frigida* C. A. Mey. ex Iljin subsp. *frigida*

$2n$ = ca. 36–38: *Kelso 84-398.* U.S.A. Alaska. Seward Peninsula. Darby Mts., Bendeleben Quad.: NE of Death Valley and Tubutulik River.

This amphi-Beringian taxon shows a wide range of chromosome numbers: $2n$ = 38, 57, and ca. 76 in North America and $2n$ = 58, 60, 70, and 76 in Russia (Downie and Denford 1986). The count reported here provides additional documentation for the diploid cytotype (x = 19), which is now known from six localities, all in Alaska (Wolf 1980; Downie and Denford 1986).

The generalization of Wolf (1980) and Downie and Denford (1986), that diploids of this species are primarily restricted to unglaciated areas of central Alaska and that polyploids occur in glaciated areas, holds only as the broadest of regional generalizations, but not in the particular. Four of the five diploids reported by Wolf (1980) are from well within the geographic limits of late-glacial advances, and the one tetraploid count for Alaska (Johnson and Packer 1968) is from an area unglaciated throughout the Quaternary (Hamilton et al. 1986). Whereas the Seward Peninsula as a whole was largely unglaciated (Kaufman and Hopkins 1986), the diploid reported here is from a landscape that experienced local glaciation.

While it is clear that the diploids are restricted to Alaska, surprisingly, they are absent from the adjacent Chukotsk Peninsula, which experienced a similar glacial history where refugial areas persisted throughout the Quaternary. The ancestral stock presumably dispersed from Alaska at some time prior to the last glacial

maximum, perhaps as early as the Tertiary, leaving related taxa disjunct in the Canadian Rockies (*Arnica louiseana*) and in the Gulf of St. Lawrence (*A. griscomii* subsp. *griscomii*; Downie and Denford 1986).

Wolf (1989) has determined that the name *Arnica griscomii* subsp. *frigida* must be used when following the treatment of Downie and Denford (1986, 1988) in which *A. frigida* is treated at the rank of subspecies and distinct from the Rocky Mountain taxon *A. louiseana* Farr.

Artemisia borealis Pall.

Oligosporus borealis (Pall.) Polyak.

$2n = 36$: *Kelso 83-278.* U.S.A. Alaska. Seward Peninsula. Teller Quad.: Gold Run Creek.

This is the same tetraploid number as reported from several localities elsewhere in the circumpolar north (Löve and Löve 1975; Dawe and Murray 1979). Korobkov (1981), however, also has mapped numerous diploid ($2n = 18$) cytotypes in western Chukotka and arctic Sakha (Yakutia), which, evidently, he was unable to distinguish morphologically from the tetraploids.

Artemisia furcata M. Bieb.

Artemisia trifurcata Steph.

$2n = 72$: *Kelso 83-236.* U.S.A. Alaska. Seward Peninsula. Kigluaik Mts., Solomon Quad.: near Homestake Creek.

Löve and Löve (1975) reported only diploid ($2n = 18$) numbers for this species, but Korobkov (1972, 1981) has since mapped the occurrence of both diploids and tetraploids ($2n = 36$) in northeastern Asia. The cytotypes are geographically segregated: the diploids are known from the Taimyr Peninsula to approximately Chaun Bay in Western Chukotka and the tetraploids throughout Eastern Chukotka, the Chukotsk Peninsula, and Wrangel Island. The chromosome number is not known for the Asiatic populations disjunct far to the south in the region of Lake Baikal.

The Alaskan counts of $2n = 72$ (this report) and $2n = 90$ (Johnson and Packer 1968, as *Artemisia trifurcata*) show an interesting progression of higher ploidy levels eastward across the Bering Strait. The Alaskan material reported by Dawe and Murray (1979) as *A. furcata* with $2n = 18 + 0–3f$ is *A. globularia* Besser.

Artemisia senjavinensis Besser

$2n = 36$: *Kelso 83-201.* U.S.A. Alaska. Seward Peninsula. Kigluaik Mts., Bendeleben Quad.: Mi. 50 Kougarok Road.

$2n = 36$: *Kelso 83-237.* U.S.A. Alaska. Seward Peninsula. Kigluaik Mts., Solomon Quad.: near Homestake Creek.

$2n = 36$: *Kelso 83-310.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Dexter Peak.

These three reports, all from the Seward Peninsula in western Alaska, add to the array of diploid counts for the taxon (Dawe and Murray 1981b). Although Korobkov (1981) knew only of $2n = 54$ cytotypes on Chukotka, he noted the existence of smaller (and more coarsely tuberculate) pollen grains on a specimen he saw from the Seward Peninsula, and therefore predicted the existence of diploid plants in Alaska.

In the view of Korobkov and B. A. Yurtsev[1] (pers. comm.), many of the Alaskan plants tend to have a more open growth form than the more consistently pulvinate plants from Chukotka; thus they apply the name *Artemisia senjavinensis* in a narrow sense to the Russian plants only. They then treat the Alaskan taxon as distinct from *A. senjavinensis* and give it the name *A. androsacea* Seem. [or *A. senjavinensis* subsp. *androsacea* (Seem.) Shed.]. Whereas the Chukotkan plants are uniformly $2n = 54$, both $2n = 36$ and 54 are known for Alaskan specimens (Dawe and Murray 1981b), which are without parallel morphological discontinuities; thus the cytotypes cannot be distinguished except by counts. Furthermore, there are Alaskan plants equally pulvinate and indistinguishable from those on Chukotka; therefore, we view these differences as falling within the range of variation of one species, *A. senjavinensis.*

Crepis nana Richardson

$2n = 14$: *Kelso 83-257.* U.S.A. Alaska. Seward Peninsula. Bendeleben Quad.: Kuzitrin River.

This count is consistent with others for the species in North America and Asia (Löve and Löve 1975; Dawe and Murray 1979;

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[1] The surname Юрцев is rendered as Jurtsev and Yurtsev. There is good correspondence in pronunciation between the letters Ю and J in Latin and German, but Yurtsev is the preferred spelling to achieve that same good correspondence in English. B. A. Yurtsev retains the spelling Jurtsev when his name appears Latinized, as an epithet, or as the authority for an epithet or combination.

Krogulevich and Rostovtseva 1984). Contrary to the distribution map given in Hultén (1968), this species is common in the interior of the Seward Peninsula.

Saussurea nuda Ledeb.

$2n = 26$: *Kelso 83-158.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Nome River estuary.

This same number was obtained from nearby Koyuk, Alaska (Dawe and Murray 1981b), and from western Chukotka (Zhukova 1966).

Taraxacum carneocoloratum A. Nelson

$2n$ = ca. 36: *Parker 1280.* U.S.A. Alaska. Alaska Range. McGrath Quad.: Post Lake.

Until recently this species was known from type specimens alone (Denali National Park). It has since been reported from the Ogilvie Mountains of Yukon Territory, Canada (Porsild 1974), and several additional localities in Alaska (Murray and Lipkin 1987). The chromosome count given by Mulligan and Porsild (1970) for the Ogilvie Mountains is $2n = 32$.

Tephroseris yukonensis (A. E. Porsild) Á. Löve & D. Löve

Senecio yukonensis A. E. Porsild

$2n$ = ca. 46: *Kelso 83-152.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Newton Peak.

This is the first count, albeit approximate, for this endemic of Alaska and Yukon. The voucher specimen for this count differs from several others at ALA in having less densely floccose pubescence on the involucres and peduncles, and in this respect it approaches *Senecio subfrigidus* Komarov (fide B. A. Yurtsev), which has a number of $2n = 48$ (Zhukova 1980), characteristic of tephroserids (Löve and Löve 1975).

BRASSICACEAE

Braya glabella Richardson

$2n$ = ca. 56: *Kelso 83-209a.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Teller Road.

This is a relatively common species on the Seward Peninsula and the coastal plain of the Alaskan Arctic Slope, to which Hultén (1968) had incorrectly applied the name *Braya pilosa* Hook. The voucher specimen for this count consists of small plants with

narrow leaves and siliques with long styles, attributes that are characteristic of populations on the Seward Peninsula and also specimens we have seen from the opposite site of the Bering Strait on Arakamchechen Island. These specimens resemble *B. bartlettiana* Jordal of the central Brooks Range, which, to us, falls within the range of variability of *B. glabella.*

This species appears to be dibasic (x = 7 and 8), based on counts of $2n$ = 28, 56, and 64 (Dawe 1979). Our specimens also match well those we have seen for *Braya aenea* Bunge subsp. *pseudoaenea* V. V. Petrovsky at LE from Chukotka, for which counts of $2n$ = 28 and 56 have been obtained (Zhukova and Petrovsky 1984).

Cardamine microphylla Adams subsp. ***blaisdellii*** (Eastw.) D. F. Murray & S. Kelso, *comb. et stat. nov.* Based on *C. blaisdellii* Eastw., Bot. Gaz. 33:146, 1902. TYPE: U.S.A. Alaska. Cape Nome, summer 1900, *F. E. Blaisdell s.n.* [HOLOTYPE: CAS (fiche!); ISOTYPE: GH!]

$2n$ = 28: *Kelso, Flock, and Colson 63.* Seward Peninsula. Teller Quad.: Cape Prince of Wales.

This is the first count for this taxon in Alaska. The numerous voucher specimens at LE documenting the counts of Zhukova and Petrovsky (1984) show both $2n$ = 28 and 42 from populations of this taxon in Chukotka.

Among the predominately white-flowered representatives of arctic *Cardamine,* several names have been applied: *C. digitata* Richardson, *C. microphylla* Adams, *C. richardsonii* Hultén, *C. hyperborea* O. E. Schulz, and *C. blaisdellii* Eastw. Most taxonomic accounts agree that 1) there is one taxon with narrow, linear-lanceolate leaflets, and 2) there is a second, variable one with orbicular to elliptic leaflets that shows a distinct tendency in the Bering Strait region toward lobed and toothed forms. The first taxon is *C. digitata*; it is amply distinct from the second morphologically, but the two have been associated nomenclaturally.

The problem began when Schulz (1903) proposed *Cardamine hyperborea* as a new name with the explicit, but mistaken, purpose of providing a replacement for Richardson's *C. digitata,* which he believed to be a later homonym of *C. digitata* (Lam.) O.E. Schulz, based on *Dentaria digitata* Lam. (=*C. pratensis L.*). Unfortunately, some of the specimens Schulz cited as the basis for his *C. hyperborea* are of another species, not Richardson's, a

discrepancy noted by Porsild (1938) and Hultén (1945). Hultén believed there still existed a need to replace the so-called later homonym *C. digitata,* for which he proposed *C. richardsonii* as the substitute, typified by Richardson's specimen.

Rollins has written that since the combination *Cardamine digitata* (Lam.) O. E. Schulz was made 80 years after Richardson had proposed his name, there is no impediment to the use of *C. digitata* Richardson. "Since *C. hyperborea* Schulz was a direct substitution for *C. digitata* Richardson, it rests on the same type and whether the description Schulz gave fits or not is not significant in so far as name priority" (Rollins 1952). The name *C. hyperborea* Schulz is superfluous. Hultén's name *C. richardsonii* is, for the same reason, also superfluous, and *C. digitata* Richardson remains the correct name for the taxon.

What name are we to apply to the second element in Schulz's *Cardamine hyperborea*? Porsild (1938) referred these plants to *C. blaisdellii,* which Hultén (1945) placed in synonymy with *C. microphylla.* Petrovsky (1975) recognized *C. microphylla* but continued to recognize another taxon to which he applied the name *C. hyperborea.* This taxon he distinguished from *C. microphylla,* at least in part, by the shape of the leaflets: the terminal one being larger than the lateral and all of them often toothed and lobed. Porsild (1974) also noted a Bering Strait variant within *C. microphylla* in which the basal leaves tend to be lobed, the same taxon to which he had previously applied the name *C. blaisdellii* (Porsild 1938).

Having reviewed the specimens that Porsild (CAN), Hultén (S), and Petrovsky (LE) used as the basis for their treatments, we can see that, in addition to *Cardamine digitata,* two taxa are recognizable: *C. microphylla,* and *C. hyperborea* in the sense it was still being used by Petrovsky. The question is, what name should apply to the latter. *Cardamine blaisdellii* is the correct name, if the taxon is treated at the rank of species. However, because the morphological discontinuity between *C. blaisdellii* and *C. microphylla* is not always clear cut, we propose that it be recognized at the rank of subspecies.

Cochlearia groenlandica L.

Cochleariopsis groenlandica (L.) Á. Löve & D. Löve

$2n = 14$: *Kelso, Flock, and Colson 66.* U.S.A. Alaska. Seward Peninsula. Teller Quad.: Cape Prince of Wales.

This count is consistent with others for this taxon throughout the Arctic (Löve and Löve 1975). Nordal and Laane (1990) and Nordal (pers. comm., 1995) apply the name *Cochlearia groenlandica* to the arctic, autogamous, diploid taxon and *C. officinalis* L. to the self-incompatible tetraploid ($2n = 24$). This breeding behavior of the tetraploid is unusual, for polyplody is often correlated with self-compatibility (Kelso 1992; Molau 1993).

Draba cinerea Adams

$2n$ = ca. 48: *Kelso 84-381.* U.S.A. Alaska. Seward Peninsula. Darby Mts., Bendeleben Quad.: near Death Valley.

Counts of both $2n = 48$ and 64 have been reported by Mulligan (1971) from arctic Canada and by Zhukova and Petrovsky (1984) from northeast Asia.

Draba glabella Pursh

Draba hirta auct.

$2n$ = ca. 64: *Kelso 83-272.* U.S.A. Alaska. Seward Peninsula. Teller Quad.: Gold Run Creek.

Previous counts of $2n = 64$ have been obtained throughout northern Canada and $2n = 80$ at just two localities in the Eastern Arctic (Mulligan 1970), while counts of $2n$ = ca. 75 (Rollins 1966) and ca. 80 (Johnson and Packer 1968) exist from elsewhere in Alaska. When discussing the cytogeography of the taxon for the Eastern Canadian Arctic and Greenland, Mulligan (1970) remarked that the octoploid ($2n = 64$) is more common (that is, it has been counted more often) than the decaploid. It would be interesting to know the distribution and relative abundance of the three Alaskan cytotypes, for *Draba glabella* is common throughout the Arctic Slope and Bering Strait regions.

Smelowskia borealis (Greene) W. H. Drury & Rollins

$2n = 12$: *Parker 1734.* U.S.A. Alaska. Alaska Range. Mt. Hayes Quad.: Rainbow Mt.

This is the third count for this endemic of Alaska and Yukon (Dawe and Murray 1979, 1981a). The reports in Löve and Löve (1975) from Chukotka are based not on *Smelowskia borealis* but a close relative, *Ermania parryoides* Cham., which occurs in both diploid and tetraploid cytotypes.

Smelowskia calycina (Stephan) C. A. Mey. var. *integrifolia* (Seem.) Rollins

S. spathulatifolia Velichkin

$2n = 12$: *Kelso 84-405.* U.S.A. Alaska. Seward Peninsula. Darby Mts., Bendeleben Quad.: Camp Haven.

Löve and Löve (1975) have treated this taxon as synonymous with *Smelowskia porsildii* (Drury & Rollins) Jurtsev (*S. calycina* var. *porsildii* Drury & Rollins). *Smelowskia calycina* var. *integrifolia* is distinguished by its mix of both shallowly lobed and entire, broadly spatulate basal leaves with short petioles, whereas var. *porsildii* consistently has narrow, entire, ligulate basal leaves with long petioles.

Variety *integrifolia* has chromosome numbers of $2n = 12$ (this report) and $2n = 22$ (Dawe and Murray 1979). Tetraploid plants ($2n = 24$) are known on Chukotka (Yurtsev and Zhukova 1972). Its Rocky Mountain relative var. *americana* (Regel & Herder) Drury & Rollins has also been counted at $2n = 12$ in Colorado, Wyoming, and Utah (Drury and Rollins 1952) and at $2n = 22$ in Alberta (Packer 1968). One might think that the $2n = 22$ plants are aneuploids derived from tetraploids, possibly producing seed by agamospermy, but Greene (1978) found normal megagametogenesis in the one Alberta population of var. *americana* he studied.

Variety *porsildii* has a chromosome number of $2n = 22$ in Alaska (Johnson and Packer 1968) and, surprisingly, also $2n = 18$ and 24 (Zhukova and Petrovsky 1984, as *Smelowskia porsildii*) in eastern Chukotka. The more compact forms of var. *porsildii* have been segregated as *S. jurtzevii* Velichkin (Velichkin 1974).

The problem of explaining numbers $2n = 12$, 22, and 24 in var. *integrifolia*, $2n = 18$, 22, and 24 in var. *porsildii*, and $2n = 12$ and 22 in var. *americana* points to the need for more counts to determine the morphologic and geographic limits of these taxa. *Smelowskia calycina* var. *media* Drury & Rollins, an endemic of northeastern Alaska and northwestern Yukon and the fourth member of the North American complex of taxa centered on *S. calycina*, is thus far known only at $2n = 12$.

Smelowskia pyriformis W. H. Drury & Rollins

$2n = 12$: *Parker 1256.* U.S.A. Alaska. Alaska Range. McGrath Quad.: Post Lake.

This is the first count for this rare endemic of Alaska (cf. Murray and Lipkin 1987).

CARYOPHYLLACEAE

Gastrolychnis involucrata (Cham. & Schlecht.) Á. Löve & D. Löve

Gastrolychnis affinis (Vahl) Tolm. & Kozhanch., *Melandrium affine* Vahl, *Silene involucrata* (Cham. & Schlecht.) Bocq., *Lychnis affinis* J. Vahl ex Fries

$2n = 48$: *Kelso 83-265.* U.S.A. Alaska. Seward Peninsula. Bendeleben Quad.: Kougarok Road.

This count is consistent with the one other count from Alaska (Johnson and Packer 1968) and with numerous counts from northeastern Asia (Krogulevich and Rostovtseva 1984).

The species assemblage to which this taxon belongs, although generally placed in *Melandrium, Silene,* or *Lychnis,* is sufficiently distinct from the others to warrant separation as the genus *Gastrolychnis* (McNeill 1978; Kozhanchikov and Tolmachev 1971; Löve and Löve 1975; Czerepanov 1995). The use of *G. involucrata* as the name for this taxon follows Czerepanov (1995).

Regardless of how others reported their numbers, Löve and Löve (1975) restricted to *Gastrolychnis affinis* the number $2n = 24$ and, incorrectly in our view, reassigned all counts of $2n = 48$ to *G. involucrata* subsp. *tenella,* which Czerepanov (1995) has reduced to synonymy under *G. taimyrensis* (Tolm.) Czer. (see below).

Gastrolychnis taimyrensis (Tolm.) Czer.

Lychnis taylorae B. L. Rob., *Melandrium taylorae* (B. L. Rob.) Tolm., *Silene taylorae* (B. L. Rob.) Hultén, *Gastrolychnis involucrata* subsp. *tenella* (Tolm.) Á. & D. Löve, *G. angustifolia* Rupr. subsp. *tenella* (Tolm.) Tolm. & Kozhanch., *G. tenella* (Tolm.) Kuvajev.

$2n = 48$: *Kelso 84-414.* U.S.A. Alaska. Seward Peninsula. Bendeleben Quad.: Kougarok Road near Pilgrim River.

This report is consistent with the two counts (as *Melandrium taylorae*) from interior Alaska (Knaben 1968; Dawe and Murray 1980).

Following Czerepanov (1995), *Gastrolychnis taimyrensis* includes *G. angustifolia* subsp. *tenella* of Eastern Siberia and the

Russian Far East, which has a chromosome number of $2n = 48$ as determined from Sakha (Zhukova, Korobkov, and Tikhonova 1977) and western Chukotka (Zhukova and Petrovsky 1977).

Kozhanchikov and Tolmachev (1971) placed *Melandrium taylorae* in synonymy with *Gastrolychnis angustifolia* subsp. *tenella*, a decision that specimens of both taxa at ALA would bear out. Therefore, what has been regarded as an endemic of Alaska and Yukon (*M. taylorae*) is now seen as distinctly amphi-Beringian.

Honckenya peploides (L.) Ehrh.

Arenaria peploides L.

$2n = 68$: *Meyers 86-9.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: vic. Nome.

There are two additional counts of $2n = 68$ from Alaska (Johnson and Packer 1968; Packer and McPherson 1974.). Other numbers reported for this species from throughout the circumpolar north are $2n = 66$, ca. 66, 68–70, and 70 (Löve and Löve 1975).

Minuartia arctica (Stev.) Asch. & Graebn.

Arenaria arctica Stev., *Lidia arctica* (Stev.) Á. Löve & D. Löve

$2n =$ ca. 80: *Kelso 83-265.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Dexter Peak.

$2n = 80$: *Kelso 83-302.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Dexter Peak.

There is another count of $2n =$ ca. 80 (Mulligan and Porsild 1969) from central Yukon and one of $2n = 52$ from arctic Alaska (Johnson and Packer 1968). Löve and Löve (1975) cited the report of $2n =$ ca. 50 by Packer and McPherson [1974, as *Arenaria obtusiloba* (Rydb.) Fern.] under *Lidia arctica.* We have not seen the voucher for the Packer and McPherson count and therefore have not determined if that change of their original determination by Löve and Löve (1975) is justified.

Silene williamsii Britton

S. menziesii Hook. subsp. *williamsii* (Britton) Hultén

$2n = 24$: *Parker s.n.* U.S.A. Alaska. Yukon-Tanana Upland. Circle Quad.: Circle Hot Springs.

This count is consistent with three other counts for this taxon from interior Alaska (Knaben 1968).

Wilhelmsia physodes (Fisch. ex Ser.) McNeill

Arenaria physodes Fisch. ex Ser.

$2n = 70$: *Meyers 86-7.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: vic. Nome.

The chromosome numbers reported for this species are extremely variable; this report adds one more variant to the list: $2n = 50–60, 66, 72, 100–110$ (Löve and Löve 1975; Dawe and Murray 1981a).

FABACEAE

Astragalus aboriginum Richardson

$2n = 16$: *Kelso 83-156.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Monument Creek.

One previous count for the diploid is from the subarctic interior of Alaska (Dawe and Murray 1979). The count attributed by Löve and Löve (1975) to Johnson and Packer (1968) cannot be found in their paper. There are also two reports of a tetraploid ($2n = 32$) in arctic Alaska (Hedberg 1967; Holmen 1962).

In Löve and Löve (1975), *Astragalus aboriginum* unaccountably disappeared from the list of arctic plants and was replaced by two other names: *A. lepagei* Hultén for the diploid and *A. richardsonii* Sheldon for the tetraploid. According to Yurtsev (1986), *A. lepagei* is a superfluous name for the amphi-Beringian *A. tugarinovii* Basil., which in the Russian Arctic has chromosome numbers of $2n = 16$, 32, and 48.

Astragalus nutzotinensis J. Rousseau

$2n = 22$: *Parker 1735.* U.S.A. Alaska. Alaska Range. Mt. Hayes Quad.: Rainbow Mt.

This count for this Alaska and Yukon endemic is consistent with two others for the species (Dawe and Murray 1979; Ledingham 1960).

Oxytropis arctica R. Br.

$2n = 48$: *Kelso 84-410.* U.S.A. Alaska. Seward Peninsula. Bendeleben Quad.: Darby Mts. near Camp Haven.

The taxonomic disposition of this fruiting material is not an easy matter, but the presence of minute processes on the margins of the stipules favors the determination as *Oxytropis arctica.* Although Löve and Löve (1975) claim the chromosome number to be $2n = 96$, they do report $2n = 48$ for *O. koyukukensis* A. E. Porsild, which is clearly part of the same complex.

Oxytropis bryophila (Greene) Jurtsev

Oxytropis nigrescens (Pall.) Fisch. subsp. *bryophila* (Greene) Hultén

$2n$ = ca. 32: *Kelso 83-204.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Anvil Mt.

This count is consistent with others for the species (Löve and Löve 1975, incorrectly cited therein as *Oxytropis tschuktschorum* Jurtsev).

GENTIANACEAE

Gentiana glauca Pall.

Gentianoẟes glauca (Pall.) Á. Löve & D. Löve

$2n$ = 24: *Kelso 83-299.* U.S.A. Alaska. Seward Peninsula. Solomon Quad.: Big Creek Valley.

This count is consistent with others for the species (Löve and Löve 1975).

ONAGRACEAE

Epilobium hornemannii Rchb.

$2n$ = ca. 36: *Kelso 83-178.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Anvil Mt.

Our count is consistent with others for the species (Löve and Löve 1975).

PAPAVERACEAE

Papaver alboroseum Hultén

$2n$ = 28: *Holmes s.n.*, 16 July 1991. U.S.A. Alaska. Denali National Park.

Our count for this North Pacific endemic is only the second to be based on Alaskan material (Dawe and Murray 1981b). The Alaskan counts are consistent with others for the species in the Russian Far East (Zhukova and Petrovsky 1987).

Papaver macounii Greene subsp. *discolor* (Hult.) Rändel ex D. F. Murray

$2n$ = 28: *Kelso s.n.*, 1 July 1984. U.S.A. Alaska. Seward Peninsula. Nome Quad.: Glacier Creek Road.

Rändel (1977) proposed that $2n$ = 28 was characteristic of

Papaver macounii on the islands of the Bering Sea (subsp. *macounii*), whereas those on the mainland (subsp. *discolor*) were characterized by $2n = 70$ and ?42 (sic.). She evidently was unaware of the four previous counts at $2n = 28$ for *P. macounii* from localities in interior and arctic Alaska (Knaben 1959, 1968; Johnson and Packer 1968; Packer and McPherson 1974). The count reported here is from near the type locality for subsp. *discolor*.

Mulligan and Porsild (1969) reported (as *Papaver radicatum* Rottb. s.l.) one count of $2n = 70$ for *P. macounii* subsp. *discolor* from a locality in Yukon Territory, Canada. There are several counts of $2n = 70$ for *P. paucistaminum* Tolm. & V. V. Petrovsky on Chukotka and Wrangel Island (Zhukova and Petrovsky 1985), a species clearly very close to *P. macounii* subsp. *discolor,* and more work is needed to resolve this taxonomic relationship.

Horn (1938) reported only a single count of $2n = 28$ based on seed of plants from St. Paul's Inlet (St. Paul Island), which he had obtained from Rolf Nordhagen and, which, according to Knaben (1959), had originated from a collection of Eric Hultén. The count of $2n = 42$ attributed to Horn (1938) by Knaben (1959, Part A, Table 2, p. 22) is clearly the source for Rändel's report for the mainland population (as "?42"), and, equally clearly, it is based on a misprint in Knaben (1959).

Papaver mcconnellii Hultén

P. denalii Gjaerevoll

$2n = 28$: *Parker 1281.* U.S.A. Alaska. Alaska Range. McGrath Quad.: Post Lake.

$2n = 28$: *Kelso 82-66.* U.S.A. Alaska. Seward Peninsula. Teller Quad.: Kigluaik Mts., Crete Creek.

These are the first counts for *Papaver mcconnellii,* an endemic of Alaska and Yukon. Although not mapped for the Seward Peninsula by Hultén (1968), we have found it repeatedly on screes in the Kigluaik Mountains. This has been an enigmatic species, for, until quite recently, our understanding of it has been based on the original description, the type specimen, and two other specimens from Healy, Alaska (Porsild 1951). Abundant material collected in Yukon Territory (Cody 1996) now gives us a clear picture of this species and also shows well the link to *P. denalii* Gjaerevoll, which is fairly common on calcareous screes and summits in the central and southern Alaska Range. The type spec-

imen of *P. mcconnellii* and many specimens from the British Mountains, for example, have leaf lobes that are generally elongate, lingulate or lanceolate, whereas the leaf lobes of *P. denalii* from the type locality in the Alaska Range and the Kuskokwim Mountains can be short and ovate, even orbicular. Numerous plants with intermediate leaf form occur within the Alaska Range.

Papaver walpolei A. E. Porsild

$2n = 14$: *Kelso s.n.*, 16 August 1985. U.S.A. Alaska. Seward Peninsula. Nome Quad.: Cleveland Creek.

This count establishes the chromosome number for an Alaskan population of this Beringian endemic. Zhukova and Petrovsky (1971) have reported two counts of $2n = 14$ for *Papaver walpolei* from the Chukotsk Peninsula. Their earlier report of $2n = 42$ for material from Wrangel Island (erroneously reported as $2n =$ ca. 84 in Löve and Löve 1975) was based on *P. gorodkovii* Tolm. & V. V. Petrovsky (Zhukova and Petrovsky 1985).

POLEMONIACEAE

Polemonium acutiflorum Willd.

$2n = 18$: *Kelso, Flock, & Colson 165.* U.S.A. Alaska. Seward Peninsula. Teller Quad.: Cape Prince of Wales.

This count is consistent with others for the species (Löve and Löve 1975; Dawe and Murray 1979).

POLYGONACEAE

Rumex acetosa L. subsp. *alpestris* (Scop.) Á. Löve

$2n = 15$: *Kelso 83-179.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Anvil Mt.

Two cytotypes, $2n = 14$ and 15, have been reported for this taxon. Our count is consistent with another for Alaska (Johnson and Packer 1968) and with many others from throughout its broad geographic range [Löve and Löve 1975, as *Acetosa pratensis* Mill. subsp. *arifolia* (Blytt & Dahl) Á. Löve].

PRIMULACEAE

Androsace septentrionalis L.

$2n = 20$: *Kelso 83-116.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Cape Nome.

This count is consistent with others for the species (Dawe 1979; Dawe and Murray 1979).

Primula egaliksensis Wormsk. ex Hornem.

$2n = 36$: *Holmes s.n.* U.S.A. Alaska. Copper River Delta. Cordova Quad.: Alaganik Slough.

This primarily American species is most closely related to *Primula nutans* Georgi (*P. sibirica* Jacq.), a widespread Eurasian diploid found occasionally in interior and western Alaska (Kelso 1991). A previous Alaskan count was $2n$ = ca. 36 (Johnson and Packer 1968), and one from Colorado was $2n = 36$ (Löve et al. 1971). The Siberian counts, however, have been $2n = 40$ (Zhukova et al. 1973; Zhukova 1982).

RANUNCULACEAE

Ranunculus cymbalaria Pursh

Cyrtorhyncha cymbalaria (Pursh) Britton

$2n = 16$: *Meyers 86-2.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: vic. of Nome.

This count is consistent with others for the species [Löve and Löve (1975), as subsp. *alpina* (Hook.) Á. Löve & D. Löve].

Ranunculus gmelinii DC.

$2n = 16$: *Kelso 83-267.* U.S.A. Alaska. Seward Peninsula. Bendeleben Quad.: vic. of Dahl.

$2n = 16$: *Kelso 83-270.* U.S.A. Alaska. Seward Peninsula. Teller Quad.: Teller Airport.

These are the first counts from Alaska for the diploid cytotype; previous counts for the species have been $2n = 32$ (Johnson and Packer 1968; Packer and McPherson 1974). Diploids are known elsewhere in North America from Manitoba (Löve and Ritchie 1966) and northern Quebec (Hedberg 1967) and from northeastern Asia [Krogulevich and Rostovtseva (1984), together with $2n = 24$ and $2n = 32$].

Ranunculus pygmaeus Wahlenb.

$2n = 16$: *Kelso 83-244.* U.S.A. Alaska. Seward Peninsula. Solomon Quad.: E side Kigluaik Mts., near Homestake Creek.

This count is consistent with others for the species (Löve and Löve 1975).

ROSACEAE

Potentilla egedii Wormsk.

Argentina anserina (L.) Rydb. subsp. *groenlandica* (Tratt.) Á. Löve

$2n = 28$: *Meyers 86-1.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: vic. Nome on Council Road.

This count is consistent with others for the species (Löve and Löve 1975; Dawe and Murray 1979).

SAXIFRAGACEAE

Boykinia richardsonii (Hook.) A. Gray

$2n$ = ca. 80: *Kelso 83-299.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Anvil Mt.

Previous reports for this endemic of Alaska and Yukon are $2n = 36$ (Knaben 1968) from the interior of Alaska and $2n$ = ca. 84 (Packer and McPherson 1974) and $2n = 84$ (Johnson and Packer 1968) from two arctic localities.

Saxifraga nelsoniana D. Don

Saxifraga punctata auct.

$2n$ = ca. 80: *Kelso 83-313.* U.S.A. Alaska. Seward Peninsula. Teller Quad.: Cape Prince of Wales.

Other counts from Alaska and Yukon are $2n$ = ca. 84 (Johnson and Packer 1968) and $2n = 84$ (Mulligan and Porsild 1969; Packer and McPherson 1974). Counts of $2n = 60$, 64, 80, and 84 have been reported from Siberia and the Russian Far East (Löve and Löve 1975; Krogulevich and Rostovtseva 1984).

The report of $2n = 28$ (Packer 1964), based on material from the Richardson Mountains of Yukon, and several others at $2n = 28$ and 30 from Siberia and the Russian Far East (Krogulevich and Rostovtseva 1984) should, most likely, be referred to *Saxifraga porsildiana* (Calder & Savile) Jurtsev & V. V. Petrovsky [*S. punctata* L. subsp. *porsildiana* Calder & Savile, *S. nelsoniana* subsp. *porsildiana* (Calder & Savile) Hultén].

Saxifraga nudicaulis D. Don subsp. *nudicaulis*

$2n = 40$: *Kelso 83-233.* U.S.A. Alaska. Seward Peninsula. Nome Quad.: Kigluaik Mts., Nugget Creek.

This is apparently the first count from North America for this Beringian endemic. The same count has been obtained from at

least three localities on the Chukotsk Peninsula (Krogulevich and Rostovtseva 1984).

Saxifraga reflexa Hook.

$2n = 20$: *Kelso 84-380.* U.S.A. Alaska. Seward Peninsula. Bendeleben Quad.: Darby Mts.

The same count was obtained in northwestern arctic Alaska (Johnson and Packer 1968) and the Richardson Mountains of northern Yukon (Packer 1964).

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